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Evaluation of Canada's Provision of Meteorological Warning Services for Defined Regions of the Arctic Ocean (METAREA Initiative)

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Acronyms used in the report

CCG	Canadian Coast Guard
CIS	Canadian Ice Service
CSB	Corporate Services Branch
DFO	Department of Fisheries and Oceans Canada
DPR	Departmental Performance Reports
EC	Environment Canada
FTE	Full Time Employee
Gs&Cs	Grants and Contributions
GMDSS	Global Maritime Distress and Safety System
HF	High frequency
IHO	International Hydrographic Organization
IMO	International Maritime Organization
IPY	International Polar Year
MSC	Meteorological Service of Canada
MSI	Maritime Safety Information
MCTS	Marine Communications and Traffic Service
NOAA	National Oceanic and Atmospheric Administration
PAA	Program Alignment Architecture
POR	Public Opinion Research
PM	Performance Measurement
QMS	Quality Management System
RPP	Report on Plans and Priorities
S&T	Science and Technology
SMT	Services to Marine Transportation
SSC	Shared Service Canada
WES	Weather and Environmental Services
WMO	World Meteorological Organization

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The Evaluation Project Team was led by Gavin Lemieux, under the direction of the Environment Canada Evaluation Director, William Blois.

The evaluation was conducted by Goss Gilroy Inc. and the Evaluation Directorate, Audit and Evaluation Branch.

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Executive Summary

Background

This report presents the results of the evaluation of Canada's Provision of Meteorological Warning Services for Defined Regions of the Arctic Ocean (the METAREA Initiative). The purpose of this evaluation was to assess the relevance and performance of the METAREA Initiative.

The METAREA Initiative is a five-year initiative, funded from 2010-11 to 2014-15 for \$26.46 million. The goal of the METAREA Initiative is to strengthen safety and promote environmental protection for marine activity in the Arctic. The expected outputs of this activity are meteorological, sea-state and ice bulletins which will be transmitted to ships traversing METAREAs XVII and XVIII, and others monitoring the broadcasts, such as domestic and international safety and security agencies, to support safe and efficient marine navigation. Ultimately, the activities and outputs are expected to result in direct and immediate outcomes that lead to the following final outcomes:

- Canada demonstrates Arctic sovereignty;
- Reduced risk of marine safety incidents in METAREA XVII and XVIII related to meteorological, sea-state and ice conditions;
- Increased efficiency of marine navigation and economic activities in the North; and
- Reduced risk to human safety and property from hazardous meteorological, sea-state and ice conditions in the North.

The study period for the evaluation is a four-year timeframe from 2010-2011 to 2013-2014. Data collection for the evaluation occurred between November 2013 and February 2014, and involved a review of documentation and literature, an analysis of program performance data, and key informant interviews with internal and external stakeholders.

Findings and Conclusions

The findings of the evaluation are very positive overall, and indicate that the program is highly relevant, well managed and delivered, and making solid progress toward intended outcomes. Program delivery might be further strengthened through the refinement of existing performance measurement systems and by leveraging federal partnerships to expand information dissemination and enhance operations.

Relevance

The evaluation evidence confirms that the METAREA Initiative addresses a need for more robust meteorological maritime safety information (MSI) in the Arctic to accommodate an expected expansion in shipping and resource extraction activities. EC's METAREA Initiative also complements other initiatives, such as DFO's NAVAREA Initiative, that together provide both meteorological and navigational MSI in Canada's assigned METAREAs. There are, however, several new initiatives underway in the North by other government departments that may have implications for the METAREA Initiative

or offer opportunities for collaboration and synergies (e.g., Aboriginal and Northern Development Canada's Canadian High Arctic Research Stations and the Canadian Coast Guard's emerging strategy to create marine transportation corridors in the North).

The METAREA Initiative supports federal priorities through an enhanced presence and service provision in the Arctic METAREAs, consistent with Canada's priorities for promoting Arctic sovereignty and supporting the development of potential in the North. The Initiative is aligned with departmental strategic outcomes and priorities related to ensuring that Canadians are equipped to make informed decisions on changing weather, water and climate conditions, and is aligned with federal responsibilities as a participating member state of the IMO. Accepting responsibility for METAREAs also demonstrates Canada's compliance with international law and policy (e.g. Article 43 of United Nations Convention on the Law of Sea,¹ or the delivery of safety and weather services emphasized in the International Convention for the Safety of Life at Sea (SOLAS)²).

Effectiveness

Evidence suggests that the METAREA Initiative is making appropriate progress toward meeting targets with respect to the quality and accessibility of meteorological MSI, as demonstrated by: the advancement of weather and ice forecast modelling in the Arctic; the program's success in meeting or exceeding the vast majority of performance targets; progress of meteorological MSI bulletins toward compliance with international standards; and progress toward 100% geographic coverage of the METAREAs by 2015. Although progressing well on all intended outcomes related to the quality and accessibility of forecast information in the METAREAs, some respondents nonetheless expressed a desire for more information on ice edge than that required by international guidelines and better geographic coverage of the METAREAs during peak shipping season. Both of these issues are expected to be addressed before the project is completed in 2015.

Given the early stage of implementation and monitoring, there is insufficient evidence to assess the overall use of the METAREA Initiative information by mariners, or the indirect benefits of the Initiative for economic sectors and Northern residents. MSC is undertaking outreach to potential users to raise awareness and collect feedback to inform the METAREA Initiative.

With respect to final outcomes, the evaluation suggests that the METAREA Initiative reinforces Arctic sovereignty through a growing infrastructure, presence and enhanced capability in the North. Qualitative feedback also confirms the logical conclusion that the METAREA Initiative contributes to reduced risks to human safety and the environment, although there are limited data available and a relatively short program implementation period to demonstrate this trend base on shipping accident data.

¹ *United Nations Convention on the Law of Sea*, I-31363 (entered into Force 16 November 1994, ratified by Canada 7 November 2003).

² *International Convention for the Safety of Life at Sea*, 1974, 1 November 1974, UNTS 1184 (entered into force 25 May 1980, accession by Canada 25 May 1980).

Efficiency and Economy

Most of those involved in the METAREA Initiative feel the design and delivery of the METAREA Initiative has been appropriate to achieve intended outcomes (e.g., project management approach and organization of tasks into five components) and few alternatives to the program design were noted. The vast geography, delivery costs and small market would inhibit other potential providers.

The METAREA Initiative is generally being delivered as designed, despite occasional operational and staffing challenges. The METAREA Initiative five-year allocation was approximately \$26 million, and actual spending on activities has been relatively consistent with the planned spending. Cost recovery is not viewed as viable and is felt to be at odds with the Initiative's core mandate (i.e., information for maritime safety).

While Canada currently meets internationally prescribed standards regarding broadcasts, a potential design enhancement concerns additional (Internet-based) dissemination channels to allow for more detailed and on-demand information linked to geo-spatial capabilities.

Governance and roles and responsibilities are clear and appropriate. The Prince2 project management approach assists by clearly identifying roles and responsibilities, including decision-making authority of a Project Board and Executive.

The Initiative is viewed as efficient, in large part due to leveraging of existing core weather and ice production systems and collaborations. Detracting from efficiency are paperwork and approval burdens associated with the project management system, time required to secure multi-agency approvals for infrastructure installations, and difficulties in recruitment of personnel.

A performance measurement strategy has been approved for the program, and annual reports are issued based on a collection of almost 30 performance indicators, many of which have targets established. While considerable data collection is occurring through the Prince2 project management system, this primarily tracks output-related information. There is less client-centred information to assess achievement of intended outcomes regarding use and usefulness of the METAREA Initiative products and services.

Recommendations

The following recommendations are based on the findings and conclusions of the evaluation. The evaluation recommendations are directed to the Assistant Deputy Minister, Meteorological Services of Canada (ADM MSC), in view of the ADM's responsibility for the overall management of the METAREA Initiative.

- 1. Continue efforts to engage users (alongside the DFO NAVAREA Initiative) to better determine and prioritize their needs and options for disseminating meteorological (and navigational) MSI in the future.**
- 2. Revisit the program's logic and performance measurement strategy to ensure that intended outcomes are sensible and measurable, and that the**

performance indicators are streamlined to meaningfully address program performance.

- 3. Engage with domestic partners that are active in the Arctic to explore whether opportunities exist to collaborate on new and emerging initiatives.**

The ADM MSC agrees with the recommendations and has developed a management response that appropriately addresses each of the recommendations. The full management response can be found in Section 6 of the report.

1.0 Introduction

This report presents the results of the Evaluation of Canada's Provision of Meteorological Warning Services for Defined Regions of the Arctic Ocean (METAREA Initiative) which was conducted by Goss Gilroy Inc. and Environment Canada's (EC) Evaluation Directorate, Audit and Evaluation Branch in 2013-14. The evaluation was identified in the 2013-14 Departmental Risk-Based Audit and Evaluation Plan and conducted in order to meet a commitment to evaluate the initiative, as well as the TB *Policy on Evaluation* requirement to evaluate all direct program spending every five years.

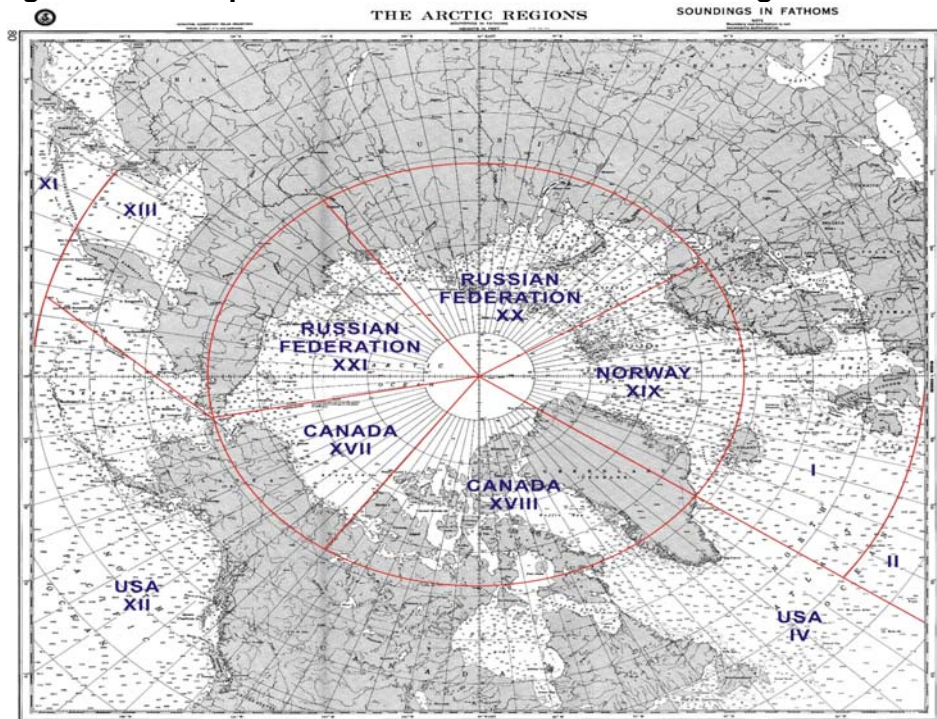
The document is organized as follows: Section 2.0 provides background information on the METAREA Initiative. Section 3.0 presents the evaluation design, including the purpose and scope of the evaluation, and the approach and methods used to conduct the evaluation. Section 4.0 and 5.0 lay out, respectively, the evaluation's findings and conclusions. The recommendations and management response are presented in Section 6.0.

2.0 Background

2.1 Program Overview

In recognition of the potential for significant increases in Arctic shipping as ice margins recede, the International Maritime Organization (IMO) expanded the Maritime Safety Information (MSI) service of the Global Maritime Distress and Safety System (GMDSS) to the North Pole through the implementation of five new METAREAs. METAREAs are geographical areas established by the IMO to transmit meteorological MSI, comprised of marine weather and ice forecasts and warnings. Two of these areas have been assigned to Russia, and one to Norway. The remaining two areas (XVII and XVIII) are mainly composed of Canadian Arctic waters (including the Canadian Northwest Passage) and a portion of international waters in the High Arctic, but also include waters north of Alaska and along part of the western coast of Greenland.

Figure 1 provides a map of the five METAREAs, representing circumpolar Arctic marine coverage to the North Pole.

Figure 1: Circumpolar Arctic Marine METAREA Coverage

In 2007, with formal approval from the Minister of Fisheries and Oceans and the Deputy Minister of the Environment, Canadian officials informed the international community of Canada's willingness to take on Arctic METAREA responsibilities. The IMO confirmed Canada as the Issuing Service for METAREAs XVII and XVIII in April 2008. In September 2009, the World Meteorological Organization (WMO) made an international public announcement to this effect. The timetable for implementation of the new Arctic METAREAs required the commencement of test services on July 1, 2010, and prescribed the official launch of circumpolar Arctic METAREA services on June 1, 2011.

The METAREA Initiative is a five-year initiative (2010-11 to 2014-15) to launch services in METAREAs XVII and XVIII for which Canada has accepted responsibility. The goal of the METAREA Initiative is to strengthen safety and promote environmental protection for marine activity in the Arctic.

2.2 Program Delivery

The METAREA Initiative involves five components. 1) expansion of the Meteorological Services of Canada (MSC) weather and ice forecast production system and forecast products and protocols for the provision of METAREA services; 2) science support to enhance and tailor forecast models for the Arctic; 3) installation of monitoring infrastructure (weather stations and buoys) and acquisition of satellite observations to gather data in the METAREAs for forecasting; 4) creation and staffing of weather and ice operational forecast desks to produce the meteorological bulletins; and 5) packaging and dissemination of the bulletins. Each of these is described in more detail below.

Component 1: Service and Platform Design, Development and Implementation

This activity comprises the design, development and implementation of: 1) a forecast production system to enable the production of the weather and ice forecasts unique to the provision of METAREA services. This is required to support the expansion and enhancement of EC's current localized marine and ice services to include full coverage of METAREAs XVII and XVIII; and 2) the forecast products and protocols consistent with formats and standards prescribed by the international community for the provision of METAREA MSI services (e.g., GMDSS broadcast standards). A METAREA specific product was developed to amalgamate this information, ultimately integrating the marine weather, sea-state and ice forecasts and warnings into a single bulletin.

Component 2: Science Support and Technology Transfer

This activity is comprised of the scientific research and technological development efforts related to addressing the unique challenges and complexities posed by the arctic environment which are essential in supporting the implementation and sustainable delivery of EC's METAREA services in the Arctic. This will include tailoring existing forecast models to be specific to the Arctic (coupling of ice, atmosphere and the ocean) and developing enhanced models to address gaps as a result of expanding services to the vast geography encompassed by METAREAs XVII and XVIII.

Component 3: Monitoring (*in-situ* and space-based)

This activity involves a modest expansion of EC's existing environmental monitoring networks to areas where no such infrastructure exists in order to represent the full geography of Arctic METAREAs XVII and XVIII with respect to the provision of the METAREA services. This includes: 1) an expanded and enhanced *in-situ* monitoring network of automated marine weather stations and an array of buoys in the Arctic. Operating and capital resources were allocated to achieve site readiness, and to procure and install the new environmental observation platforms, including the installation and upgrading of marine weather stations, and deployment of ice and marine buoys; and 2) an increased acquisition of space-based observations to complement *in-situ* observations in the delivery of weather and ice information services for METAREAs XVII and XVIII. Space-based data are obtained from a variety of sources including, but not limited to, RADARSAT (1, 2 and Constellation Missions), and the National Oceanic and Atmospheric Administration (NOAA) and European and Japanese Space Agencies.

Component 4: Operational Desks, including recruitment and training

An operational program has been established for the METAREA forecast activities related to producing the operational meteorological bulletins. This includes establishing two operational forecast desks, one for weather and one for ice. These forecast desks produce weather forecasts for METAREAs XVII and XVIII, as well as sea state and freezing spray forecasts, ice warnings with more in-depth information including ice concentration and type, ice hazards and areas of ice pressure. Within the five years of this Initiative, the goal of the Initiative is to expand these weather, ice and sea-state services to 24/7, year-round coverage for the navigable waters of METAREAs XVII and

XVIII. This component includes funding for recruitment and training of personnel for the incremental operational requirements.

Component 5: Product Dissemination

METAREA products generated by the two METAREA operational desks for full METAREA coverage are assembled and packaged into comprehensive METAREA marine and ice bulletins for dissemination to mariners. By the end of the implementation phase, the intention is to merge marine and ice bulletins into a single bulletin. The merged bulletin will be disseminated twice-daily to users throughout METAREAs XVII and XVIII over GMDSS, using the SafetyNET service Inmarsat-C satellite system covering waters up to 75°N, and via Fisheries and Oceans Canada (DFO's) high frequency (HF) radio telex transmissions in the High Arctic (above 75°N). The bulletin transmissions are monitored to ensure that the messages are indeed successfully broadcast internationally and that Canada meets the GMDSS broadcast standards, responding to issues as they arise.

2.3 Stakeholders

The primary target audiences for the Initiative include Canadian and international safety and security agencies, and international and domestic mariners. Ancillary beneficiaries are the weather-sensitive economic sectors operating in the North, along with Northern residents who will benefit indirectly from the METAREA Initiative through improved data and models for weather and ice forecasting in the North.

Coordination of the METAREA services is through the WMO's METAREA Coordinator and Canada's METAREA Coordinator who resides within EC. Through international meetings, service levels and standards are discussed and adjusted as needed.

The implementation of the Initiative involves partnerships with both internal and external organizations:

Environment Canada

- MSC is the responsible Branch within EC for the METAREAs Initiative and directly leads Components 1, 3, and 4. The METAREA Initiative is a service expansion of MSC's core weather program and, therefore, there are important interrelationships with this program;
- Science and Technology (S&T), responsible for component 2; and
- Corporate Services Branch supports information technology development within Component 1 and provides administrative supports.

Other government departments

- Shared Services Canada (SSC) provides information technology services and support to all components, and has primary responsibility, in conjunction with MSC, for the delivery of component 5, product dissemination;
- DFO/Canadian Coast Guard (CCG) is responsible for the NAVAREA Initiative (production of navigational MSI in the METAREAs). In addition, DFO/CCG transmits METAREA Initiative bulletins North of 75°N using its High Frequency (HF) radio. The DFO Ocean Science group collaborates with EC on ocean-ice-air

- model and forecast development. DFO/CCG supports the MSC in the deployment of ice and marine buoys and beacons as part of component 3; and
- DND also supports the MSC in the deployment of ice and marine buoys and beacons as part of component 3.

External partners

- Universities, including an agreement with the University of Manitoba for assistance with installation of monitoring equipment (in exchange for access to meteorological data).

2.4 Management Structure

The project management methodology selected by EC to manage this Initiative is called Prince2.³ In a Prince2 environment, the responsibility for the overall day-to-day management and administration of the METAREA Initiative rests with the METAREA Project Manager, National Service Operations, Weather and Environmental Prediction and Services, within the constraints laid down by the METAREA Project Board and Project Executive. The Executive is ultimately responsible for the project and represents the organization's senior business management. The Executive is the ultimate decision maker and is supported in the decision making by the members of the Project Board (senior users and senior suppliers). The Project Board meets twice a year to assess progress and is also convened when an issue is identified that requires a decision by the Board. Highlights reports are produced on a quarterly basis and prior to Project Board meetings.

The five components that comprise the Initiative are each led by a Component Lead. The Component Lead is responsible for specific project coordination. Each component has at least one or more Activity Leads to coordinate the work of the different divisions, sections or units.

2.5 Resource Allocation

The METAREA Initiative is funded for five years (2010-11 to 2014-15) for \$26.46 million, as presented in Table 1. The Initiative involved 19.5 full time employees (FTE) for the first fiscal year, increasing to 42.5 FTEs by 2012-13 and is planned to plateau at 34 FTEs by 2014-15.

Table 1: METAREA Resource Allocations 2010-11 to 2014-15

Fiscal Year / Exercice financier	FTE / EPT	Salary / Salaries	EBP / RASE	O&M / F et E	Capital	PWG SC / TPSGC	Total
2010-11	19.5	1,586,933	317,387	674,949	320,000	150,731	3,050,000
2011-12	44.0	3,515,095	703,019	1,821,976	380,000	339,910	6,760,000
2012-13	42.5	3,316,119	663,224	1,703,795	0	326,862	6,010,000
2013-14	35.0	2,906,442	581,288	1,531,100	0	291,170	5,310,000
2014-15	34.0	2,928,650	585,730	1,509,833	0	305,787	5,330,000
Grand total		14,253,239	2,850,648	7,241,653	700,000	1,414,460	26,460,000

³ Prince2 (Projects in a Controlled Environment) is a generic, structured project management method.

A detailed comparison of program expenditures and allocations between 2010-11 and 2013-14, excluding costs for EBP, PWGSC and other enablers, is presented in section 4.2.2, Table 3.

2.6 Program Logic Model

The METAREAs Initiative comprises part of the Meteorological and Ice Services in Support of Marine Navigation sub sub-program 2.2.2 in EC's program activity architecture (PAA). METAREA activities and outputs are expected to result in direct and intermediate outcomes that lead to the following primary final outcomes:

- Canada demonstrates Arctic sovereignty;
- Reduced risk of marine safety incidents in METAREA XVII and XVIII related to meteorological, sea-state and ice conditions; and
- Increased efficiency of marine navigation and economic activities in the North.

The logic model also identifies several direct and intermediate ancillary benefits of the Initiative, called "associated" outcomes, which concern the quality, accessibility, and use of meteorological and ice information for economic sectors and Northern residents. In the longer term, these benefits are expected to result in a:

- Reduced risk to human safety and property from hazardous meteorological, sea-state and ice conditions in the North.

The logic model for the METAREA Initiative is included in Annex 1.

3.0 Evaluation Design

3.1 Purpose and Scope

The purpose of this evaluation is to assess the relevance and performance (including effectiveness, efficiency and economy) of the METAREA Initiative, thus fulfilling a commitment to evaluate the Initiative and meeting the requirements of the TB Policy on Evaluation to evaluate all direct program spending every five years. While evaluations typically explore issues related to ongoing program management, the METAREAs Initiative is a time-bound initiative tied inextricably to the start-up or initial implementation of the METAREAs. As such, issues of implementation and ongoing delivery are treated interchangeably in the context of the current evaluation.

Since associated outcomes are not included in the program performance measurement strategy, they are also not assessed in the current evaluation. The effectiveness of the program is evaluated in relation to the Initiative's primary intended outcomes, as described in Section 2.6 (above) and Annex 1.

The evaluation covers the four-year time frame from 2010-2011 to 2013-14 and addresses only the actions taken under the METAREAs Initiative, as a related evaluation of the 2.2.2 sub-program, Meteorological and Ice Services in Support of Marine Navigation, had already been completed in 2011. That evaluation was larger in scope, but did not contain evidence related to the METAREAs, as the Initiative had only recently been funded. This evaluation builds on the 2011 evaluation.

3.2 Evaluation Approach and Methodology

Data collection for the evaluation occurred between November 2013 and February 2014. The following data collection methodologies were employed and evidence from these methods triangulated to develop findings and conclusions.⁴

Document and Literature Review

A document and literature review was conducted as part of the evaluation. Key documents were gathered, listed in an inventory and then each document was assessed in terms of its contribution to each of the evaluation questions and corresponding indicators using a document review template. Documents included: descriptive program information (such as the Project Charter), departmental and Government of Canada publications related to policy and priorities, and other internal strategic and operational planning documents. The literature review largely focused on grey literature pertaining to marine and economic activity in the North. This data collection method addressed evaluation questions related to the relevance of the METAREA Initiative. A list of documents that were reviewed is included in Annex 2.

Program Administrative and Performance Data

A review of program data included administrative and performance data maintained on the METAREA Initiative ECOLLAB website or provided by program representatives. The performance measurement annual reports for the Initiative (2011 and 2012) were important to understanding the extent of achievement of project milestones. Other administrative data sources included progress reports and financial records, including allocated and expended resources for each component by fiscal year. This data collection method addressed evaluation questions related to effectiveness and program efficiency.

Key Informant Interviews

Key informant interviews were conducted in-person and by telephone with a total of 23 internal and external stakeholders. Given the early stage of implementation of the Initiative and difficulty contacting knowledgeable users of METAREA services, gathering feedback from external stakeholders was challenging and resulted in a heavier than usual reliance on the views of program personnel in assessing the evaluation issues. This issue is addressed in more detail under challenges and limitations. The following provides a breakdown of the interviewees:

- EC program managers and project officers (n=8)
- Federal implementation partners (n=6)
- Potential users of information (n=5)
- Other external stakeholders (international partners) (n=4).

For each category of interviewee, a customized, open-ended guide was developed that considered the knowledge of the respondent and the nature of their expected contribution to the evaluation. Interviewees received a copy of the interview guide in advance of the interview, allowing them time to prepare. Notes from the interviews were entered into a matrix by interview question/evaluation issue, which enabled sorting of the information by interviewee category and evaluation issue for analytical purposes. The

⁴ A Data Collection Instruments Technical Appendix is available under separate cover, which contains the instruments used for each methodology.

findings from the key informant interviews addressed all evaluation questions, but were particularly important for the performance issue.

3.3 Challenges and Limitations

Challenges experienced during the conduct of the evaluation, as well as the related limitations and strategies used to mitigate their impact, are outlined below.

1. *Obtaining input from end-users*

The methods identified for the evaluation did not include a broad-based canvassing of end-users of METAREA's information products and services because: the program did not yet have any means of capturing data on real or potential end-users; developing a contact list to support a survey of users was beyond the scope of the project; and previous efforts to conduct public opinion research with users have had very limited success. While these challenges were addressed to some extent by gathering the views of a limited number of users through key informant interviews, scope limitations meant that not all user groups were included in the key informant interviews. In particular, direct feedback from representatives from economic sectors and Northern residents, two ancillary beneficiary groups for the Initiative, was not collected at all. As a result, limited evidence is available to address the program's achievement of intended "associated outcomes" involving these two groups of potential beneficiaries.

2. *Addressing achievement of intermediate and final outcomes*

Due to the absence of reliable data from end-users it is difficult to assess the achievement of certain intermediate and final outcomes of the Initiative. It should also be noted that at the time of the evaluation, full service coverage in the METAREAs had not yet been achieved as the Initiative is scheduled to be completed on March 31, 2015. Where appropriate, administrative data and qualitative interview information were used, to the extent possible, to address these issues.

4.0 Findings

This section presents the findings of this evaluation by evaluation issue (relevance and performance) and by the related evaluation questions. For each evaluation question, a rating is provided based on a judgment of the evaluation findings. The rating statements and their significance are outlined below in Table 2. A summary of ratings for the evaluation issues and questions is presented in Annex 3: Summary of Findings.

Table 2: Definitions of Standard Rating Statements

Statement	Definition
Acceptable	The program has demonstrated that it has met the expectations with respect to the issue area.
Opportunity for Improvement	The program has demonstrated that it has made adequate progress to meet the expectations with respect to the issue area, but continued improvement can still be made.
Attention Required	The program has not demonstrated that it has made adequate progress to meet the expectations with respect to the issue area and attention is needed on a priority basis.
Not applicable	There is no expectation that the program would have addressed the evaluation issue.
Unable to assess	Insufficient evidence is available to support a rating.

4.1 Relevance

4.1.1 Continued Need for Program

Evaluation Issue: Relevance	Rating
1. Is there a continued need for the METAREA Initiative?	Acceptable

Declining sea ice in the Arctic has prompted the international community to implement five new Arctic METAREAs to provide meteorological Maritime Safety Information in recognition of the anticipated increase in shipping and other activity in the Arctic. There is no problematic duplication between the METAREA Initiative and other activities, although a number of complementary initiatives in the North were mentioned.

- The review of documentation indicates that interest in Arctic shipping is anticipated to increase due to declines in the extent and thickness of sea ice. Satellite data indicate that, since 1979, winter Arctic ice has decreased nearly four per cent each decade⁵. By the summer of 2007, satellite imaging captured the opening of the Northwest arctic. In 2013, the Danish Nordic Orion was the first commercial bulk carrier to complete this voyage.
- The Arctic Council's 2009 assessment of Arctic marine use acknowledged that the level of vessel activity is relatively small – representing less than two per cent of the world's registered fleet of large ocean-going vessels. However, the report also noted that “the number of ships operating today in the Arctic is significant in the context of both the unique aspects of the Arctic environment and the insufficient infrastructure and emergency response in many parts of the region, relative to southern waters”⁶.
- Interviewees across all respondent groups confirm the need for the METAREA Initiative. They note that weather, sea and ice information were previously very limited in Arctic regions. Vessels accessed information on an ad hoc basis and in non-standard formats. At the same time, key informants noted that expected reductions in sea ice will lead to increases in Arctic shipping (commercial shipping traffic, resource development, scientific research or recreational travel) and to increased demand for information to assist vessels to safely navigate these waters.
- Most interviewees state that the Initiative does not duplicate other activities, though there are recommended redundancies to ensure continuity of information and safety of mariners (e.g., broadcasting information related to icebergs is considered both meteorological and navigational MSI).
- Key informants mentioned several new initiatives underway in the North by other government departments that may offer opportunities for collaboration. These include initiatives such as the Canadian High Arctic Research Station (CHARS) (funded by Aboriginal Affairs and Northern Development Canada (AANDC)), expansion of the CCG's Automatic Identification System (AIS) that will support

⁵ National Snow & Ice Data Center. *Sea Ice*. Online: http://nsidc.org/cryosphere/sotc/sea_ice.html

⁶ Arctic Council. *Arctic Marine Shipping Assessment*. 2009 Report. Online: http://www.pame.is/images/stories/AMSA_2009_Report/AMSA_2009_Report_2nd_print.pdf

implementation of the e-Navigation concept, and CCG's emerging strategy to create marine transportation corridors in the North.

4.1.2 Alignment with Federal Government Priorities

Evaluation Issue: Relevance	Rating
2. Is the METAREA Initiative aligned with federal government priorities?	Acceptable

The METAREA Initiative is aligned with the federal government priority on the North, including promoting Arctic sovereignty and supporting potential development in the North. The Initiative represents an expansion of EC's existing meteorological services, which support the strategic outcome related to "Canadians are equipped to make informed decisions on changing weather, water and climate conditions".

- The review of documentation identifies the Arctic region as a priority of the federal government. In the 2010 Speech from the Throne⁷, the Government of Canada announced the establishment of "the Northern Strategy ... to increase marine safety and reduce pollution from shipping and other maritime traffic." The Northern Strategy⁸ was developed with a focus on four priority areas: exercising Arctic sovereignty; promoting social and economic development; protecting the North's environmental heritage; and improving and devolving northern governance. In the 2013 Speech from the Throne⁹, Canada's Northern sovereignty continued to be identified as a priority of the government.
- In support of this priority, Budget 2010 announced new funding for the METAREA Initiative. In addition, federal funding was also allocated to DFO for the parallel NAVAREAs and to the Canadian Space Agency for its RADARSAT Constellation Mission, which is an important data source for ice information.
- Most internal program interviewees confirmed the close alignment between the METAREA Initiative and Canada's Northern Strategy. The Initiative supports the strategy by providing meteorological MSI to support safe navigation and economic activities in the North. Canada's responsibility for the Arctic METAREAs and presence in the Arctic were perceived to reinforce Arctic sovereignty objectives.
- Evidence from documentation and EC interview respondents indicate that the Initiative is aligned with EC's departmental strategic outcome to ensure "Canadians are equipped to make informed decisions on changing weather, water and climate conditions".

⁷ Government of Canada. Speech from the Throne. March 3, 2010. Online: <http://www.pco-bcp.gc.ca/index.asp?lang=eng&page=information&sub=publications&doc=aarchives/sft-ddt/2010-eng.htm>

⁸ Government of Canada. *Canada's Northern Strategy. Our North, Our Heritage, Our Future. Undated.* <http://www.northernstrategy.gc.ca/index-eng.asp>

⁹ Government of Canada. *Speech from the Throne.* October 16, 2013. Online: http://speech.gc.ca/sites/sft/files/sft-en_2013_c.pdf

4.1.3 Consistency with Federal Roles and Responsibilities

Evaluation Issue: Relevance	Rating
3. Is the METAREA Initiative consistent with federal/departmental roles and responsibilities?	Acceptable

The METAREA Initiative is consistent with the federal responsibility for, and EC's mandate to provide, meteorological information, including for marine safety and security. The METAREA Initiative fulfills Canada's commitment as the Issuing Service for METAREAs XVII and XVIII. The federal level has the expertise, capacity, forecasting knowledge and resources to provide services in national and international waters. The Initiative utilizes the existing infrastructure and expertise of EC's Weather and Environmental Prediction and Services program.

- The *Constitution Act, 1867* assigns legislative powers on Navigation and Shipping, and Sea Coasts and Inland Fisheries, to the Parliament of Canada.
- The *Department of the Environment Act*¹⁰ assigns jurisdiction over meteorology issues and responses to the Minister of the Environment, including the provision of environmental information to Canadians.
- According to most internal manager and staff interviewees, the Initiative addresses Canada's international commitments as the Issuing Service for METAREAs XVII and XVIII which primarily involve Canadian waters but also waters outside Canada's jurisdiction. The federal government has the expertise, installation capacity, forecasting knowledge and resources to provide services Canadian waters and waters adjacent to it.
- Accepting responsibility for METAREAs also demonstrates Canada's compliance with international law and policy (e.g. Article 43 of the *United Nations Convention on the Law of Sea* (UNCLOS)¹¹ or the delivery of safety and weather services emphasized in the *International Convention for the Safety of Life at Sea* (SOLAS)¹²). SOLAS emphasizes areas within the boundaries of Canada's exclusive economic zone and METAREAs extends Canada's participation to areas adjacent to Canadian arctic waters.

4.2 Performance

4.2.1 Achievement of Intended Outcomes

To simplify reporting given the limited availability of end-user information at this stage, the findings are presented in three general areas: direct outcomes associated with the quality and accessibility of information; intermediate outcomes associated with the use of information by various groups; and final outcomes related to arctic sovereignty, marine safety, navigation and economic activity, and human safety and safety of property.

¹⁰ R.S.C., 1985, c. E-10.

¹¹ *United Nations Convention on the Law of Sea*, I-31363 (entered into Force 16 November 1994, ratified by Canada 7 November 2003).

¹² *International Convention for the Safety of Life at Sea*, 1974, 1 November 1974, UNTS 1184 (entered into force 25 May 1980, accession by Canada 25 May 1980).

Evaluation Issue: Performance	Rating
4a. To what extent have intended direct outcomes related to the Quality and Accessibility of Information been achieved as a result of the METAREA Initiative?	Acceptable

Evidence suggests that the METAREA Initiative is making appropriate progress toward meeting targets with respect to the quality and accessibility of information given the stage of implementation of the project. The meteorological MSI bulletins are expected to be in compliance with international standards this year.

- According to many key informants, a strength of the METAREA Initiative has been the advancement of the sophistication of the weather and ice forecast modelling in the Arctic. A review of the program's performance measurement data indicates that additional data points provided by the expanded marine and surface weather stations have increased the number and quality of observations available. The forecasts have also been enhanced by the introduction of a wave model to the Arctic domain and a coupled forecasting model that integrates the atmosphere, ocean and ice conditions to reflect the dynamic interplay among these factors for greater accuracy in the models.
- During the peak shipping season, the weather operations desk is a 24/7 operation. The ice operations desk has not yet been fully operational with METAREA funding, though the staffing requirement for 10/7 has been supplemented by internal resources.
- Combined weather and ice bulletins are broadcast twice daily at a prescribed time by satellite (Inmarsat-C) south of 75°N and by CCG high frequency radio North of 75°N. The broadcasts are formatted for each marine area within the METAREAs to include the following information:
 - Warnings;
 - Synopsis; and
 - Weather and Ice Forecasts, which include marine wind, visibility, wave height, freezing spray and ice edge.

Seasonal coverage of the bulletins will undergo expansion during the METAREA Initiative, with "null" bulletins issued once weekly during winter months.

- The program is working toward WMO compliance of the METAREAs bulletins, which is expected to occur by 2014. While the WMO does not assess compliance of countries that are responsible as Issuing Service for METAREAs in an official manner, Canada has provided progress reports to the WMO METAREA Coordinator and other international bodies (e.g., the Expert Team on Maritime Safety Services). According to the Initiative's 2012 PM Annual Report, positive feedback has been received on Canada's progress and manner of implementation with respect to the Arctic METAREAs. Similarly, the consensus among key informants is that Canada's commitment to the IMO as an Issuing Service in the two METAREAs is being met, as are GMDSS guidelines for the bulletins¹³. EC key informants added that international standards and manuals were used as guidelines for format and content.

¹³ Link for GMDSS guidelines available at: <https://exchange.dnv.com/publishing/ruleship/2001-07/ts412.pdf>

- MSC monitors the products they disseminate to ensure they are broadcast successfully. Reliability of the transmission of the bulletins is very high – in 2011-12, 99 to 100 per cent of weather and ice forecasts in the north and south regions of the METAREAs XVII and XVIII were issued on time and were successfully transmitted the first time.
- Mariners who receive the bulletins may contact the MSC directly to ask questions, make suggestions or request additional information. No complaints were received from mariners in 2011-12 related to access. However, there were some special requests for information (an indicator of the adequacy of the information provided in the bulletins). In total, 16 requests for additional information were received in 2011-12, the majority of these for additional information related to ice. The analysis presented in the Performance Measurement (PM) Annual Report indicated that ice edge information provided in the merged bulletin is not sufficient to help mariners operate safely in ice infested waters. A separate ice concentration bulletin is scheduled to begin in Summer 2014.
- Although appropriate progress is being made toward the achievement of intended objectives related to the quality or reliability of forecast information in the METAREAs, some suggestions for improvement had to do with:
 - a desire expressed by a few key informants for more information in the bulletins on ice beyond the information on ice edge that is required by international guidelines. This confirms the performance data above which noted a number of special requests for additional ice information from mariners in 2011-12. As mentioned, a separate ice concentration bulletin is scheduled to begin in Summer 2014; and
 - remaining service gaps in some geographical areas within the METAREAs. Access to meteorological MSI is not available in all marine areas in METAREAs XVII and XVIII during peak shipping season, however, this is expected to have been addressed by March 2015 at the completion of the Initiative.

Evaluation Issue: Performance	Rating
4b. To what extent have intended intermediate outcomes related to Use of Information been achieved as a result of the METAREA Initiative?	Acceptable

Given the early stage of implementation and monitoring, there is very limited evidence to assess the overall use of the METAREA Initiative information by mariners, or the indirect benefits of the Initiative for economic sectors and Northern residents. While evaluation evidence suggests that mariners are using meteorological, sea-state and ice information in their operations, this evidence is anecdotal. MSC is undertaking outreach to potential users to raise awareness and collect feedback.

- The intended intermediate outcomes of the METAREA Initiative refer to use of meteorological, sea-state and ice information by:
 - Canadian and international safety and security agencies to support security operations and search and rescue response; and

- Mariners to facilitate safe and efficient navigation.¹⁴
- In addition, as an ancillary benefit of investments in monitoring and research and development, the domestic services provided to Northerners and economic sectors operating in the Canadian North will be enhanced.
- The 2012 PM Annual Report indicated that public opinion research (POR) data expected from the Marine Weather Service Survey (2013) and from the 2012 CIS website user survey would help to assess achievement of direct and intermediate intended outcomes (access and use of the METAREA information). However, the Marine Weather Service Survey did not contain cross-tabulations for Arctic water mariners or Inmarsat information users, and therefore did not render findings attributable to the METAREA Initiative. Similarly, the CIS website user survey focused largely on satisfaction with the CIS website and therefore also did not produce findings relevant to the METAREA Initiative.
- Most key informant interviewees for this evaluation agreed that the METAREA Initiative has provided access to sufficient meteorological, sea-state and ice information to facilitate safe and efficient navigation. In addition, a few key informants emphasized the improvements from previously available formats. However, key informants stated that there has been little systematic feedback from mariners and confirmation of use is ad-hoc, for example, through professional contacts with mariners and industry groups at industry meetings or through the follow-up requests that are received from users for supplementary products. A few key informants noted that there has been more outreach to promote the services and to obtain feedback from users through Canadian Marine Advisory Councils in the North. Based on interviews and program documentation, MSC representatives plan on presenting at these councils and will attempt to survey these groups, though no survey results were available at the time of evaluation.

Evaluation Issue: Performance	Rating
4c. To what extent have intended final outcomes been achieved as a result of the METAREA Initiative?	Acceptable

Canada’s active presence in the North through the METAREA Initiative was viewed by most as reinforcing Arctic sovereignty. Other intended outcomes related to reduced risk and improved efficiency of operations in the North are challenging to measure, particularly given the limited activity in the Arctic at this time. However, key informant evidence suggests a logical link between improved meteorological MSI and these intended outcomes.

Canada demonstrates Arctic sovereignty

- Most key informants, including international stakeholders, stated that Canada's presence and contribution through the METAREA Initiative reinforces Arctic sovereignty. Canada’s knowledge and capability in the North is perceived to be translating into leadership among international partners. A small number of key

¹⁴ As discussed in Section 3.1, associated outcomes related to meteorological and ice information for economic sectors and Northern residents were not assessed in this evaluation.

informants felt Arctic sovereignty could more properly be seen as an ancillary benefit of the METAREA Initiative.

Reduced risk of marine safety incidents in METAREAs XVII and XVIII related to meteorological, sea-state and ice conditions; Reduced risk to human safety and property from hazardous meteorological, sea-state and ice conditions in the north¹⁵.

- The review of documentation did not identify statistics on reduced risk of marine safety incidents. However, the 2012 PM Annual Report indicated that data are being collected by the CCG Marine Communications and Traffic Services (MCTS) and Transportation Safety Board (TSB) which will be a source of data in the future to determine associated risks and number of incidents with increases in traffic.
- Key informants were largely in agreement that improved meteorological and ice information contributes to reduction of risk. Most respondents feel that the METAREA bulletins and improvements in domestic products are providing better information (e.g., ice leads, ice spray) to support navigational decisions to improve safety, particularly in Canadian waters (less so in the high Arctic where coverage is not yet complete). However, there are measurement challenges given the absence of a baseline measure and fluctuations in traffic in the Arctic.

Increased efficiency of marine navigation and economic activities in the North

- The 2012 PM Annual Report indicates that weather and ice information can contribute to efficiencies of marine navigation and economic activities in the North. This perception was confirmed by key informants in the evaluation. As an example, for regulatory and safety reasons, mariners and shipping companies must factor weather and ice into their logistics. Improved information allows them greater flexibility in making decisions with respect to timing or routing of voyages in the Arctic during the operating season (e.g. improved timing, less down-time, more efficient routing) which can lead to significant savings.

Evaluation Issue: Performance	Rating
5. Have there been any unintended (positive or negative) outcomes?	Not applicable

No evidence of significant unintended outcomes of the METAREA Initiative was observed.

4.2.2 Efficiency and Economy

Evaluation Issue: Performance	Rating
6. Is the Initiative design appropriate for achieving its intended outcomes?	Acceptable

¹⁵ Note that the 2012 PM Annual Report indicates that this outcome has been removed from the Performance Measurement Framework and has been amended to align METAREA indicators with the new MSC Service Standards

The design of the METAREA Initiative, including the organization of activities into five components, was held to be appropriate and effective. Few alternatives to the program design were noted, although a potential design enhancement that was identified is additional (internet-based) dissemination channels. Cost recovery is not viewed as viable for METAREA Initiative products and at odds with the core mandate of the Initiative to provide information for maritime safety.

- As described above, the METAREA Initiative has been organized into five components. Most internal key informants believe the design and organization of the METAREA Initiative is appropriate for achievement of intended outcomes. These interviewees noted that the components allow managers and leads to focus on their area of specialization.
- Specifically, the components feature:
 - investments in on-land, on-ice and in-the-water monitoring infrastructure to improve the number and quality of observations available to inform forecast models given the geographic expansion and extension to year-round service delivery. There was agreement among key informants that investments in monitoring were required given the data-sparse Arctic environment and, in fact, several key informants felt that additional infrastructure to improve the density of the observations would be beneficial in the future;
 - science support and technology transfer with a northern-focus was undertaken to expand research and development related to data assimilation and coupled modelling for the atmosphere, ocean and ice. Again, key informants note that MSC understanding of Arctic weather interactions such as the impact of ice coverage on the atmospheric conditions is underdeveloped compared to the South. Research and development work was funded to improve weather and ice forecasting in Arctic conditions;
 - service and platform design involved the establishment of a system to produce weather and ice forecasts for METAREAs XVII and XVIII. Coverage of the METAREAs has been approached in a step-wise fashion. In 2014, expansion is to include areas near the North Pole and North of Greenland, with complete geographic coverage expected by March 2015. Level of marine forecast and ice service provided for METAREAs marine forecast zones is based on navigable waters and marine activity within those zones. There is no service to ice-bound METAREAs marine forecast zones if there is no known marine activity. While the design of the program has situated the CIS under the service and platform design component, the role of ice was noted to be a critical factor influencing other components of the Initiative (e.g., operations, dissemination). To date, the bulletins have ice edge information, with plans in 2014 to include more robust information on ice concentration for improved MSI;
 - staffing of operational desks (one for weather, one for ice) produce the meteorological bulletins for Canada's METAREAs; and
 - product dissemination using methods that are consistent with international standards and dictated by systems availability in domestic and High Arctic waters within the METAREAs. While the program has leveraged the DFO HF radio system for dissemination North of 75°N, the

METAREA Initiative disseminates bulletins using the Inmarsat-C satellite South of 75°N which is also utilized by the CCG MCTS for navigational bulletins.

- There were few program alternatives to the METAREA Initiative identified by key informants. Several respondents noted that the vast geography of the METAREAs and the small market for the information would inhibit other providers such as the private sector from assuming a role in meteorological or ice forecasting in the Arctic of the kind delivered by the METAREA Initiative. The review of international literature also did not reveal any alternative, more effective models. While other countries have assumed responsibility for the other new METAREAs (i.e., Russia and Norway), there has been limited exchange and coordination to date with these countries (international meetings are planned for 2014). According to program managers and confirmed by international bodies, Canada’s progress on the implementation of service in the new METAREAs is similar to or more advanced than other countries.
- One potential design enhancement mentioned by a few program and international respondents is to consider additional methods of dissemination of forecast bulletins in the future. While Canada and other countries meet international (WMO) prescribed standards regarding broadcasts (CCG HF radio telex and Inmarsat-C satellite), future channels could likely include web-based methods. In the Arctic, there are currently technological limitations in broadband width for these kinds of transmissions, however, as there are technological opportunities to do so, web-based transmissions would allow for more detailed and on-demand information linked to geo-spatial capabilities. The evolution of dissemination strategies for marine weather and ice information was a key issue that was raised in the 2011 Evaluation of the Services to Marine Transportation Sub-activity, and which resulted in the establishment of a strategy to manage new approaches to disseminations based on client needs. Likewise, the CCG 2013 Commanding Officer Survey identified suggestions for colour weather charts and more frequent updates of satellite images.¹⁶
- Internal key informants were probed about opportunities to pursue cost-recovery within the METAREA Initiative. No respondents felt cost-recovery is a viable option for METAREA Initiative products and most key informants felt it was inappropriate given that the intent of the Initiative is core to the federal mandate and responsibility (see Section 4.1.3). A few key informants also noted that while it may be feasible to create enhanced, custom forecast products for mariners, the market is very small and such activities are now undertaken by commercial providers.

Evaluation Issue: Performance	Rating
7. To what extent is the governance structure clear, appropriate and efficient for achieving intended outcomes?	Acceptable

The roles and responsibilities of the METAREA Initiative stakeholders are clearly defined and understood. The governance structure of the Initiative is appropriate

¹⁶ Meteorological Service of Canada. *Canadian Coast Guard Commanding Officer Survey. Final Report of Findings*. July 2013.

and efficient according to most internal interviewees. The Prince2 project management approach assists by clearly identifying roles and responsibilities, including decision-making authority of a Project Board and Executive.

- While there are many stakeholders involved in the Initiative, overall, most staff interviewees indicate that the roles and responsibilities of the various METAREA Initiative stakeholders are clearly defined and understood. The governance structure, consisting of a METAREA project manager responsible for overall coordination and leads for each of the 5 program components, is felt to be appropriate and efficient according to most internal interviewees. A few interviewees indicate that the Prince2 project management model¹⁷ and Project Board decision-making authority contributes to clear governance by defining the roles and responsibilities of participants, elaborating the authority of the Project Board and Executive,¹⁸ and documenting meeting outcomes.
- While governance of the Initiative was perceived to be positive overall, a few key informants noted some potential to improve: 1) the level of coordination across the components (resourcing and task allocation more closely linked to clearly defined objective); 2) coordination with DFO's regionalized Science structure for research and development work requiring additional time and effort; 3) funding for Component Lead positions;¹⁹ and 4) clarity in allocating responsibility for certain Initiative budget items to the individual components.

Evaluation Issue: Performance	Rating
8. Is the METAREA Initiative undertaking activities and delivering products at the lowest possible cost?	Acceptable

The METAREA Initiative is being delivered as designed and intended. Operational challenges, often related to geographic and climate conditions in the Arctic, have not compromised most targets for deliverables. Adequate staffing (due to limited resources or recruitment difficulties) has been problematic for one component.

- Program performance data and internal key informants confirm that the METAREA Initiative is being delivered as designed and intended. The most recent 2012 PM Annual Report for the Initiative indicates that the implementation of the METAREA Initiative is on track to be completed by the end of March 2015 as planned.²⁰ Most key informants confirm that the METAREA Initiative has been

¹⁷ The Prince II project management methodology is intended to support the implementation of temporary, time-bound projects, while issues related to the design, delivery and governance of programs typically concern ongoing management issues and not those confined to project implementation. Since the METAREAs Initiative is temporary, however, issues of implementation and ongoing delivery are interchangeable in the current context. As such, it is appropriate to discuss the Prince II system in the context design and delivery of the Initiative. Should MSC receive support to maintain the service levels achieved by March 2015, then the implementation project is over and the on-going program would then be managed through MSC's existing management best practices and the quality management system.

¹⁸ See Section 2.4, for a description of the Project Board's and Executive's roles and responsibilities.

¹⁹ The Component Lead are supported out of A-Base as a contribution to MSC Signature Projects.

²⁰ Environment Canada. METAREA Initiative. Performance Measurement Annual Report 2012. July 31, 2013.

- implemented as intended (all major milestones have been met), owing in part to the disciplined application of the project management system according to some.
- According to key informants, challenges in implementation have largely been of an operational nature and are often related to the remote and massive geography of the METAREAs and the harsh Arctic climate which restricts the window of opportunity to conduct installation work. Other implementation challenges that were mentioned by some key informants included: need for multi-agency approvals to install monitoring equipment at some sites and consequent delays; organizational changes external to the Initiative that created uncertainty about roles or delays (e.g., creation of SSC and associated delays in IT management); and difficulties in recruitment and staffing the operational forecast desks. With respect to the latter, the ice services desk, for example, has not been fully operational with METAREA Initiative funding due to the staggered allocation of FTEs across the fiscal years of the Initiative for the positions required to staff the desk, as well as recruitment challenges. To address staffing challenges of the operational desks, internal MSC and CIS resources have been utilized. Finally, a few key informants noted that an expansion to become the Issuing Service in Hudson’s Bay (included within a much larger Northern Atlantic METAREA IV, which is a US responsibility) was not in the original plan for the Initiative, though has not reportedly created significant difficulties for the program.

Program inputs are appropriate to achieve intended outcomes. Analyses of available financial data show an increasingly close relationship between allocated and actual expenditures for each of the five components of the Initiative, following lapses in the inaugural year due to late receipt of funds.

- Table 3 summarizes annual allocated and actual spending on the METAREA Initiative components for the first four years of the Initiative. In the first year of the Initiative, there was underspending on the components (about 46 per cent considering all components) due to late receipt of funds in the fiscal year. For the remaining years of the Initiative, there is a closer and increasing alignment between allocated and expended funds. Internal key informants were generally satisfied with the allocation of funds to the Initiative and across the components.

**Table 3: METAREA Initiative Resources, 2010-2011 to 2013-2014
Allocated vs. Expended by Component^{***}**

Project Management	2010-11	2011-12	2012-13	2013-14	Total
Allocated	185,791	247,925	289,057	233,049	955,822
Expended ²¹	97,122	198,653	226,701	217,793	740,269
Variance	47.7%	19.9%	21.6%	6.5%	22.6%
Service and Platform Development Component	2010-11	2011-12	2012-13	2013-14	Total
Allocated	346,147	1,029,185	1,307,914	1,118,983	3,802,229
Expended	132,477	973,988	1,239,557	994,516	3,340,538
Variance	61.7%	5.4%	5.2%	11.1%	12.1%

²¹ Expenditures are actuals for 2010-11 to 2012-13. For 2013-14, expenditures are year-to-date expenditures plus commitments to year-end, from the latest MVR report available (March 10, 2014).

Science and Technology Component	2010-11	2011-12	2012-13	2013-14	Total
Allocated	611,296	1,009,596	1,164,895	1,084,584	3,870,371
Expended	298,595	964,756	1,030,552	971,304	3,265,207
Variance	51.2%	4.4%	11.5%	10.4%	15.6%
Monitoring Component	2010-11	2011-12	2012-13	2013-14	Total
Allocated	582,760	1,334,760	420,045	533,244	2,870,809
Expended	312,204	1,049,522	378,042	518,222	2,257,990
Variance	46.4%	21.4%	10.0%	2.8%	21.4%
Operations and Training Component	2010-11	2011-12	2012-13	2013-14	Total
Allocated	257,097	1,137,779	1,043,792	846,107	3,284,775
Expended	223,886	1,154,884	1,059,121	826,033	3,263,924
Variance	12.9%	-1.5%	-1.5%	2.4%	0.6%
Dissemination Component	2010-11	2011-12	2012-13	2013-14***	Total
Allocated	0	240,110	41,365	--	281,475
Expended	13,342	237,500	41,365	--	292,207
Variance	--	1.1%	0	--	-3.8%
Total	2010-11	2011-12	2012-13	2013-14	Total
Allocated	1,983,091	4,999,354	4,267,068	3,815,967	15,065,481
Expended	1,077,626	4,579,303	3,975,338	3,527,868	13,160,135
Variance	45.7%	8.4%	6.8%	7.5%	12.7%

* Data from EC's financial reporting tool, MVR

** Allocations and Expenditures reflect salary, operations and maintenance, and capital costs only. These figures are not directly comparable to Table 1 in section 2.5 as costs for EBP, PWGSC and other enablers are not included and data for 2014-15 is not presented.

*** In 2012-13 and 2013-14, funding for the Dissemination Component was partly reallocated to other project components and transferred to the newly created Department of Shared Services Canada to support the delivery of METAREA services.

The project management approach uses existing procedures such as PRINCE2 and Prince2-based EC CSB Project management templates. In addition, reports and documents are posted in an existing, shared access, ECollab site²². Key informants view the Initiative as efficient, in large part because it is an expansion of existing services and has leveraged existing core weather and ice production systems, as well as collaborations.

- According to key informants, factors supporting efficiency (mentioned by at least two key informants) include:
 - leveraging of capacity and expertise within the MSC. The integrated Arctic-specific weather and ice forecasting and prediction models are being developed within the context of EC's existing suite of operational forecast modelling systems at MSC and the CIS. Thus, the expansion of services under the METAREA Initiative has occurred within existing core

²² Environment Canada. *METAREA Initiation. Updated Project Initiation Document*. June 28, 2013

- production systems which are efficient and will benefit over time from other MSC-wide projects seeking to improve the efficiency of the overall weather enterprise; and
- leveraging of partner contributions, such as in the deployment of buoys (DND), utilization of capabilities/observations of research vessels in the Arctic for monitoring and infrastructure (in exchange for access to data) (University of Manitoba), and use of the CCG FH radio telex transmission equipment for dissemination of METAREA bulletins in the High Arctic.
- Most key informants felt Prince2 contributed to efficiency of the Initiative through its rigorous project management methodology that tracks progress on implementation and early warning when progress or expenditures drift out of established tolerance. A small number noted that aspects of the system detract from efficiency, including excessive paperwork and reporting burden and bureaucratic layering between the Activity Leads and managers. Time required to secure multi-agency approvals for installation of monitoring equipment and difficulties in recruitment of personnel were cited by a small number of key informants as additional challenges to efficient delivery.

Evaluation Issue: Performance	Rating
9. Are performance data being collected and reported?	Opportunities for improvement

The evaluation determined that performance measures are in place and are being tracked using a Performance Strategy and Framework and through the Prince2 project management system. However, while the performance data are satisfactory for capturing progress toward deliverables, measuring outcomes from the user community represents a significant challenge.

- A Performance Strategy for the METAREA Initiative was developed in 2011 and roles and responsibilities with regard to the implementation of the strategy have been established. The responsibility to gather and analyze the performance data rests with each of the five Component Leads, while responsibility to report on the performance data rests with the Executive Director of the National Service Operation through the Signature Project Lead and the METAREA Project Manager. Performance reports are to be submitted to the Director General of Weather and Environmental Prediction and Services who has the overall responsibility of the delivery of the Initiative. Regular updates are also to be provided to the IMO on the status of the test and implementation phases.
- Two Performance Measurement Annual Reports have been produced for the METAREA Initiative (2011 and 2012) and the next Performance Measurement Annual Report (2013) is scheduled to be available by 2014.²³ The reports include an analysis of overall performance, and a “Results Place Mat” table reports on 29 performance indicators using qualitative and quantitative data to measure program outputs and intended outcomes. The table reports on the target, reported value, brief analysis, and issues and path forward. Detailed results in narrative form are provided for each indicator. The annual reports are very informative in terms of measuring implementation and outputs of the Initiative, as well as direct outcomes pertaining to the accuracy, reliability and adequacy of the

²³ The Performance Measurement Annual Report for 2013 was not available at the time of writing this report.

forecast bulletins. As reported in the previous section, there are challenges in measuring and reporting indicators related to the intended intermediate and final outcomes of the Initiative (use and usefulness of the METAREA Initiative information). In addition to the performance measurement framework, the Prince2 project management system has a reporting regime that requires regular updates and progress reporting.

- In addition, End Stage Reports are produced. The purpose of the End Stage Report is to give a summary of progress to date, the overall project situation and sufficient information to ask for Project Board approval to proceed with the next stage of the project. Recommendations of the March 2013 End Stage 2 Report²⁴ are to continue to use Prince2 and hold planning sessions twice per year.
- Internal program management and staff key informants were of the opinion that METAREA Initiative performance data are appropriate and reasonable, particularly in reporting on implementation and capturing progress toward deliverables. The Prince2 documentation effectively monitors task completion for each component through the use of monthly Checkpoint reports and quarterly Highlights progress reports. The Prince2 reports inform decision-making at the Project Board level when implementation or expenditures diverge beyond an established tolerance. Annual performance and periodic briefing materials also contribute to the reporting on performance. The annual performance reports are used to inform Departmental Performance Reports.
- According to key informants, performance reporting has been less effective in capturing achievement of intended intermediate and longer-term outcomes of the METAREA Initiative. Initiative management and staff attributed the lack of outcome data to challenges in measuring the awareness, use and usefulness of the bulletins for mariners who are a small, international and mobile group with whom it is difficult to consult. For example, there is estimated to be fewer than 100 vessels that traverse Canada's METAREAs. Therefore, obtaining user feedback, such as through surveys, has been difficult. A similar challenge affected this evaluation of the METAREA Initiative and was also identified as an area for improvement in the 2011 Evaluation of the Services to Marine Transportation Sub-activity.

5.0 Conclusions

Relevance

The METAREA Initiative addresses a lack of robust meteorological MSI in the Arctic and contributes to fulfilling Canada's international commitment to the IMO to assume responsibility as the Issuing Service according to the IMO timetable.

METAREA Initiative bulletins do not duplicate in any significant way other information available to mariners, although there are several new initiatives underway in the North by other government departments that may have implications for the METAREA Initiative or offer opportunities for collaboration and synergies.

²⁴ Environment Canada. *METAREA Initiative. End Stage2 Report*. March 2013.

The METAREA Initiative is aligned with federal priorities for promoting Arctic sovereignty, and supporting the development of potential in the North, and is aligned with departmental strategic outcomes related to ensuring that Canadians are equipped to make informed decisions on changing weather, water and climate conditions.

Performance

The METAREA Initiative is meeting targets with respect to quality and accessibility of meteorological, sea state and ice information, with bulletins expected to address international standards, geographical coverage, and unmet needs for ice information by the end of 2014-15. While some evidence suggests that mariners are using meteorological, sea-state and ice information in their operations, this evidence is anecdotal given the early stage of program implementation and monitoring. No significant unintended outcomes of the METAREA Initiative were observed.

The METAREA Initiative is being delivered as designed and intended despite, occasional operational and staffing challenges. No alternative program approach or potential service provider is in evidence, governance and roles and responsibilities are clear and appropriate, and actual program spending has been relatively consistent with planned spending. A potential future design enhancement could include an expansion in dissemination channels as internet operability in the North permits.

The Initiative is viewed as efficient, in large part due to the application of a rigorous project management system, leveraging of existing core weather and ice production systems, and collaborations. Cost recovery is not viewed as a viable design option and is felt to be at odds with the core mandate of the Initiative to provide information for maritime safety.

A performance measurement strategy has been approved for the program, and annual reports are issued based on a collection of almost 30 performance indicators, most of which have targets established. While considerable data collection is occurring, there is less client-centered information to assess the achievement of intended outcomes regarding use and usefulness of the METAREA Initiative information products and services.

6.0 Recommendations and Management Response

The following recommendations are based on the findings and conclusions of the evaluation. The evaluation recommendations are directed to the ADM, MSC, in view of the ADM's responsibility for the overall management of the METAREA Initiative.

- 1. Continue efforts to engage users (alongside the DFO NAVAREA Initiative) to better determine and prioritize their needs and options for disseminating meteorological (and navigational) MSI in the future.** It was frequently noted that while the METAREA Initiative is currently meeting international standards with respect to dissemination of bulletins on meteorological MSI, needs of users and technological opportunities are expected to evolve over time.

Statement of Agreement/Disagreement with the Recommendation		
The ADM MSC agrees with the recommendation.		
Management Action		
<p>MSC is certified to the ISO-9001-2008 standard for quality management. It is also committed to the objectives of the Treasury Board Service Policy. In both cases, client engagement and an ongoing assessment of user requirements is fundamental and MSC is committed to these as part of our service delivery strategy.</p> <p>Domestically, MSC consults regularly with the users of our marine weather and ice services through a variety of forums (e.g. Canadian Marine Advisory Council and CMAC-North, Polar Shipping Summit and FEDNAV). We also participate in the National Marine Advisory Board (NMAB) and are active in the NMAB sub-committee on e-navigation. Through the e-navigation initiative being led by the Canadian Coast Guard, user requirements for information, including meteorological and ice information, in electronic formats are being assessed and prioritized.</p> <p>Internationally, MSC contributes to the METAREA Program, under the Global Maritime Distress and Safety Services (GMDSS), which must comply with the international standards and guidelines. This international community is coordinated through the World Meteorological Organization’s Marine Meteorology and Oceanography Programme and engages users through biennial surveys as well as provides contact information for ad hoc requests. Through this feedback process the programme will continue to evolve. In addition, through MSC’s membership on the Expert Team for Maritime Safety Services (an expert team of the Joint WMO/IOC Technical Commission on Oceanography and Marine Meteorology (JCOMM)), we are engaged in this continuous improvement process which would lead to service enhancements in the future, particularly in the area of dissemination technologies.</p> <p>MSC published a set of service standards for METAREAs in February 2014 (available on the Environment Canada website at: http://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=0AB09BC5-1). Our commitment is to review these standards annually and users are invited to provide feedback on them.</p>		
Timeline	Deliverable	Responsible Party
March 2015	Review of Service Standards	Marine and Ice Program Management Board

- 2. Revisit the program’s logic and performance measurement strategy to ensure that intended outcomes are sensible and measurable, and that the performance indicators are streamlined to meaningfully address program performance.** The current performance measurement strategy is comprehensive and includes 29 performance indicators. However, there are limited data for many of the program’s intended outcomes.

Statement of Agreement/Disagreement with the Recommendation		
The ADM MSC agrees with the recommendation.		
Management Action		
In accordance with the requirements of the ISO 9001/2008 quality management system, the logic model and performance measurement strategy of each program is reviewed		

annually. Through this review process we will look to streamline the number of relevant deliverables and outcomes where it makes sense to do so, in accordance with the expectations for alignment with our domestic Marine Program as well as our international obligations under the GMDSS, METAREA Program.

Timeline	Deliverable	Responsible Party
May 2014	Review of program logic model by the MSC Marine and Ice Program Management Board	Marine and Ice Program Management Board

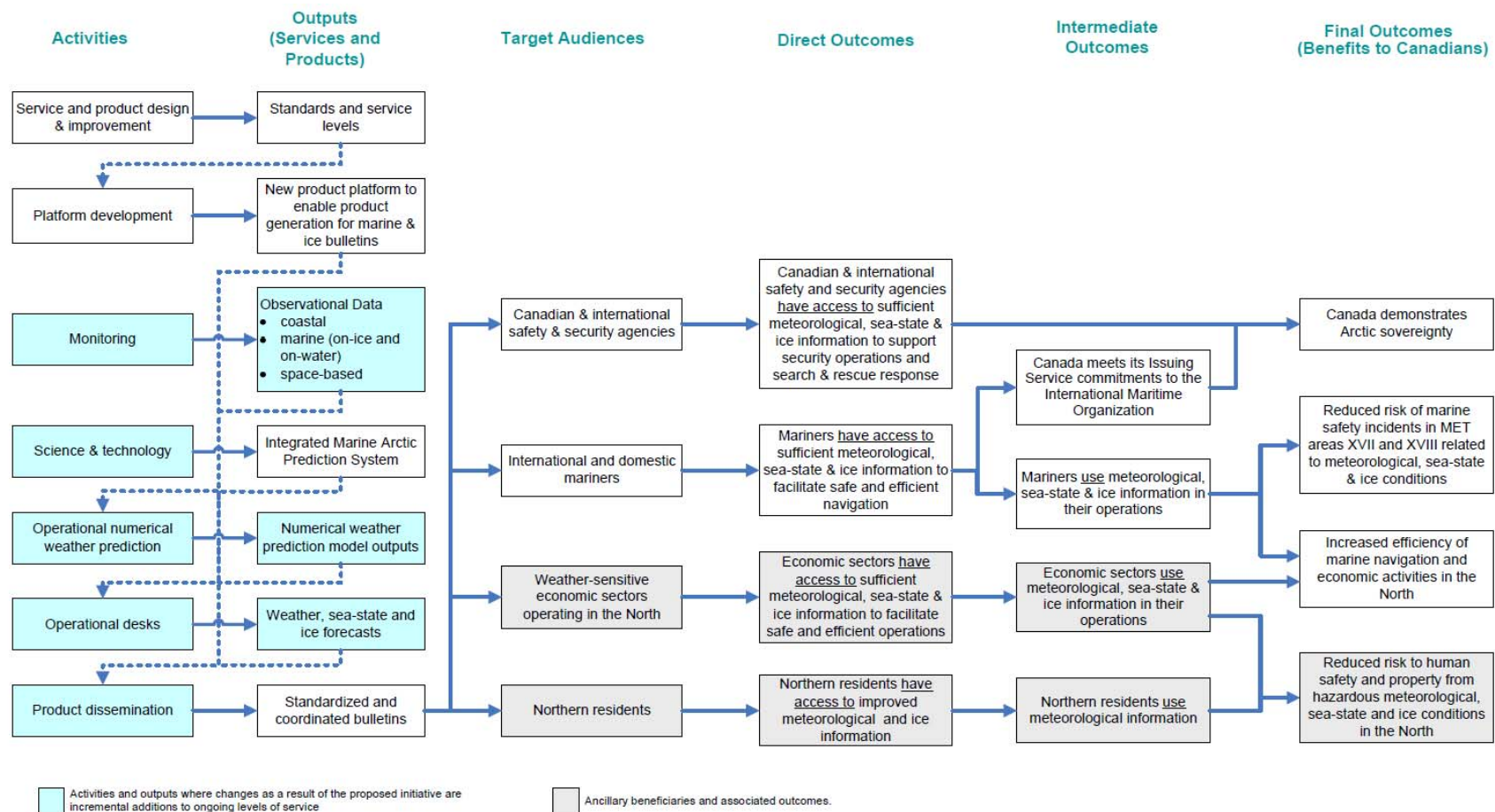
3. Engage with domestic partners that are active in the Arctic to explore whether opportunities exist to collaborate on new and emerging initiatives.

The Arctic is a key federal priority and there are numerous initiatives that are currently taking place in the region that could provide opportunities for the METAREA Initiative moving forward (e.g., dissemination utilizing CCG MCTS, research activities by AANDC, implications of the CCG Arctic corridor strategy).

Statement of Agreement/Disagreement with the Recommendation		
The ADM MSC agrees with the recommendation.		
Management Action		
<p>MSC is active in a number of federal activities in the Arctic and will continue to engage with participants to leverage opportunities and seek synergies as new opportunities arise. Examples of MSC’s collaboration with federal partners in the arctic include coordinating with CCG in proposals to Government to continue the services implemented by the MET/NAVAREA initiative, participating in a departmental DG-level Northern Working Group to coordinate Arctic activities within EC to stay abreast of broader federal initiatives, and working with Transport Canada and other departments on coordinating the federal efforts regarding e-Navigation, which is intended to bring maritime safety information directly to the bridge of a ship.</p> <p>Environment Canada’s Science and Technology Branch (STB) is also working with DFO and DND on common atmospheric, ocean, ice modelling solutions over Arctic Waters, and with other Departments on various research opportunities (BREA, CHARS, ArcticNet) in order to coordinate the science activities in the region as well as work effectively with the resources available.</p> <p>MSC will document in its METAREAs Annual Performance Measurement Report the relevant engagements with federal and other partners which enhance or leverage the delivery and effectiveness of METAREAs services in the arctic.</p>		
Timeline	Deliverable	Responsible Party
March 2015	A summary of relevant engagements with federal and other partners which enhance or leverage the delivery and effectiveness of METAREAs services in the arctic will be included in the METAREAs Annual Performance Measurement Report.	Executive Director, National Programs and Business Development

Annex 1 Program Logic Model

EC METAREA's Services Logic Model



Annex 2

List of Documents Reviewed

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13. Environment Canada. *METAREA Initiative. Performance Strategy*. Draft. November 21, 2011.
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21. Government of Canada. *Speech from the Throne*. October 16, 2013. Online: http://speech.gc.ca/sites/sft/files/sft-en_2013_c.pdf
22. <http://www.imo.org/GMDSS.asp>.
23. Government of Canada. *Canada's Northern Strategy. Our North, Our Heritage, Our Future. Undated*. <http://www.northernstrategy.gc.ca/index-eng.asp>
24. Meteorological Service of Canada. *Canadian Coast Guard Commanding Officer Survey. Final Report of Findings*. July 2013.
25. Meteorological Service of Canada. *Canadian Ice Service Website User Survey. Final Report of Findings*. February 2013.
26. Meteorological Service of Canada. *Marine Weather Services Survey. Final Report of Findings*. June 2013.
27. WMO. *WMO Liaison Report*. August 9, 2011. Online: http://www.iho.int/mtg_docs/com_wg/CPRNW/WWNWS3/WWNWS3-3-3-3A.pdf

Annex 3 Summary of Findings²⁵

RELEVANCE Evaluation Question	Acceptable	Opportunity for Improvements	Attention Required	N/A / Unable to Assess
1. Is there a continued need for the METAREA Initiative?	•			
2. Is the METAREA Initiative aligned with federal government priorities?	•			
3. Is the METAREA Initiative consistent with federal/departmental roles and responsibilities?	•			

PERFORMANCE Evaluation Question	Acceptable	Opportunity for Improvements	Attention Required	N/A / Unable to Assess
4. To what extent have intended outcomes been achieved as a result of the METAREA Initiative? a. Direct Outcomes b. Intermediate Outcomes c. Final Outcomes	• • •			
5. Have there been any unintended (positive or negative) outcomes?				•
6. Is the Initiative design appropriate for achieving its intended outcomes?	•			
7. To what extent is the governance structure clear, appropriate and efficient for achieving intended outcomes?	•			
8. Is the METAREA Initiative undertaking activities and delivering products at the lowest possible cost?	•			
9. Are performance data being collected and reported		•		

²⁵ The rating symbols and their significance are outlined in Table 2, Section 4.0.